ArcelorMittal
Indiana Harbor LLC

ArcelorMittal

Mr. Michael Mikulka
USEPA – Region 5
77 West Jackson Blvd., LU-9J
Chicago, IL 60604-3590

August 7, 2015

Re: RCRA 3013 Administrative Order IND 005 462 601
Response to USEPA Comments Dated April 28, 2015
Additional Site Investigation Report for the Former Coke Plant
Tecumseh Redevelopment, Inc., East Chicago, Indiana

Dear Mr. Mikulka:

This letter has been prepared in response to the United States Environmental Protection Agency (USEPA) correspondence dated April 28, 2015, regarding the referenced Former Coke Plant located in East Chicago, Indiana. Based on previous investigation results, additional investigations were conducted in 2012 and 2013 to further evaluate soil, groundwater, and *light non-aqueous phase liquids* (LNAPL) impacts at the Former Coke Plant. This additional investigative work scope was presented in the USEPA-approved Additional Investigation/Source Evaluation Work Plan (Revision 1) dated March 2011, prepared by the former consultant, AECOM. In January 2014, an Additional Site Investigation Report for the Former Coke Plant was prepared by Ramboll Environ US Corporation (Ramboll Environ), formerly ENVIRON International Corporation (ENVIRON) and submitted to the USEPA. The USEPA provided comments to the January 2014 Additional Site Investigation Report in a letter dated February 21, 2014. ArcelorMittal Indiana Harbor LLC (ArcelorMittal) provided responses to the USEPA's February 2014 comments in a letter dated July 14, 2014. The April 28, 2015 USEPA correspondence provided comments to the July 2014 ArcelorMittal letter and indicated that the following additional activities need to be included in a pre-design work plan to address data gaps related to the Former Coke Plant Area:

- sampling and evaluation of the uppermost 2 feet, not just the uppermost 6 inches, of soil, particularly at areas with surface soil quality data objective (DQO) exceedances;
- sampling to confirm that soil between 2 to 8 feet below ground surface (bgs) at boring MW-824D does not contain DQO exceedances;
- advancement of a soil boring in the immediate vicinity of boring MW-826M, in an effort to delineate the vertical extent of polycyclic aromatic hydrocarbons (PAH) contamination in this area; and

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- steps to confirm and document that the aquitard is continuous across the site.

In addition, the USEPA indicated that concerns regarding the proposed 5-step process for evaluating risks to aquatic organisms and human health in the Indiana Harbor Ship Canal will need to be addressed in order for the USEPA to approve the Additional Site Investigation Report. The April 28, 2015 USEPA correspondence further requested that a revised Additional Site Investigation Report, which address the April 2015 USEPA comments, and a Pre-Design Work Plan, be submitted to the USEPA.

The April 28, 2015 USEPA correspondence (page 3) indicated that it may be most efficient if the USEPA and ArcelorMittal reach agreement regarding the approach to conducting risk calculations prior to their completion. We concurred with this suggestion; therefore, we submitted a draft letter response to USEPA on June 19, 2015, which provided responses to USEPA's General Comment 3 and Specific Comment 16 of the April 2015 USEPA letter for discussion during our subsequent conference call on June 22, 2015.

In an e-mail communication dated July 9, 2015, the USEPA provided responses to the draft letter dated June 19, 2015, and indicated that a final ArcelorMittal comment response letter should be submitted to USEPA within 30 days. To meet this requirement, this letter has been prepared to provide final responses to the April 28, 2015 USEPA correspondence. The USEPA comments are identified below as numbered in the original USEPA comments dated February 21, 2014, and the corresponding responses are provided below each comment in ***bold and italic font***.

I. GENERAL COMMENTS

1. USEPA's original comment requested confirmation that geotextile fabric and at least two feet of fill have been placed over all previously identified areas of contamination exceeding Indiana Department of Environmental Management (IDEM) direct contact data quality objectives (DQOs). In its response, ArcelorMittal indicates that historical records on fabric and fill placement are unavailable because the construction contractor has gone out of business. In the absence of such records, the direct contact pathway must be considered potentially complete at the former Coke Plant, and the report text and conceptual site model should be modified accordingly. To address this issue, the facility proposes to develop and implement a more detailed surface soil sampling plan as part of the Pre-Design Investigation. USEPA agrees with this approach.

   You also note that there is a formal dig-permit program in place, and that a deed restriction will be implemented to ensure that any future users will understand the

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risks and use appropriate protection during intrusive construction activities, should ArcelorMittal vacate the site. USEPA agrees with this approach.

The report cites USEPA approval of a six-inch cover at the ArcelorMittal East Mill and requests that a similar thin cover be approved by USEPA for the former Coke Plant area. Thus, the proposed sampling would target only the uppermost 6 inches of soil in its assessment of potential DQO exceedances. However, the response does not provide any details on the basis for determining that a six-inch cover was acceptable for the East Mill (or portions thereof). Unless there are extenuating circumstances, USEPA policy is to evaluate contaminant concentrations in the uppermost two feet of soil/fill for potential direct contact exposures. IDEM direct contact criteria also apply to this typical contact zone (i.e., 0 to 2 feet of soil/fill below ground surface [bgs]).

Based on these Agency policies, USEPA reiterates the requirement that ArcelorMittal must show that at least two feet (and up to six feet) of soil has been placed over all areas with surface soil DQO exceedances before the direct contact pathway is confirmed as incomplete. Consequently, the Pre-Design Investigation Plan must include sampling and evaluation of the uppermost two feet, not just the uppermost six inches, of soil, to verify that the direct contact DQO is met. This is especially critical if portions of the former Coke Plant area may be redeveloped for recreational, commercial or other non-industrial purposes in the future.

Response: The Pre-Design Work Plan will include sampling and evaluation of the uppermost two feet of soil, to verify that the direct contact DQO is met. The scope of this evaluation in terms of sample locations and laboratory analyses to be conducted will be provided in the Pre-Design Work Plan.

2. The response to this comment is acceptable.

   Response: Confirmed.

3. Please note that the USEPA does not approve the use of the 10x dilution factor proposed as part of the evaluation of ecological risks from groundwater within the Indiana Harbor Ship Canal or Lake Michigan. The 10x dilution factor you referenced is used within the USEPA's internal groundwater environmental indicator report, but is not appropriate to use as you have suggested in your response. As is noted in your response, in a screening level ecological assessment (SLEA), maximum values are compared to the conservative screening values, or to "no observable adverse effects level" (NOAEL) benchmarks. The first step in the ERA is therefore to screen maximum concentrations, with no dilution, of each constituent found in the groundwater, against the ESLs. Those constituents that exceed the ESLs are retained for further evaluation

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in a baseline ecological risk assessment (BERA). Less conservative benchmarks, or lowest observable adverse effects level (LOAEL) benchmarks are used as part of the BERA. A tiered approach is presented in the responses to select LOAELs for use in the BERA.

Response: To clarify, the 10x factor proposed in the July 11, 2014 letter was not intended as a NOAEL-to-LOAEL adjustment factor. Rather, as further discussed below, it was intended to reflect dilution and attenuation expected to occur as groundwater is discharged to surface water. We intend to compare maximum chemical concentrations to ESLs as an initial step. A refined evaluation of potential risk will be undertaken for those chemicals that have maximum concentrations greater than their respective ESLs.

In the response to General Comment 3, ArcelorMittal acknowledges that aquatic organisms in the Indiana Harbor Ship Canal may be exposed to contaminants via groundwater discharge, and proposes a 5-step process for evaluating risks to aquatic organisms in the Indiana Harbor Ship Canal. ArcelorMittal should address the following concerns regarding the proposed 5-step approach:

Response: An expansion of analyses beyond the typical SLERA may be necessary in order to accurately characterize the likelihood of adverse ecological effects as a result of groundwater discharge to surface water via the breach in the sheet piling. In the interest of proceeding rapidly towards remediation, we will evaluate whether an expanded SLERA is sufficient to determine that no further evaluation of ecological risk is warranted. If so, the SLERA will include a conclusory step that considers factors such as:

a) **dilution and attenuation as groundwater discharges to surface water via the breach in the sheet piling;**

b) **studies that underpin screening values and resultant conservatism and uncertainty; and**

c) **chemical-physical properties (e.g., volatility, solubility, partitioning factors, influence of hardness) of groundwater constituents and how those factors influence the constituents' toxicity, bioaccumulation, volatilization, and/or partitioning to organic carbon.**

The responses that follow are intended to help clarify how and why this step will be conducted as a means of expanding the SLERA. Even if the expanded SLERA concludes that further evaluation (i.e., a BERA) is warranted, it is expected that the expanded SLERA will enable the BERA to focus on only those constituents and pathways that are likely to cause adverse ecological effects.

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- Step 1 is acceptable. Refinement of the conceptual site model is an important first step in understanding contaminant fate and transport.

  Response: Confirmed.

- The USEPA does not agree with the approach laid out in Step 2. It is not appropriate as a refinement of the ecologically based benchmark, or better stated, the first tier in selecting a LOAEL, to multiply the ESLs by 10. Although it is appropriate to calculate a NOAEL from a LOAEL assuming a 10 fold lower effect, it is not appropriate to apply this logic in reverse; that is, to calculate a LOAEL from a NOAEL. The actual lowest level of effects can be missed using this approach. Oftentimes the LOAEL is only a fraction higher than the NOAEL. Using the approach you suggest would result in a LOAEL bench mark that is not conservative enough and is not acceptable for use in this ERA. As mentioned above, all methodologies used within the USEPA groundwater environmental indicator report are not appropriate for use in the ERA. The first tier in selecting a LOAEL should be the selection of the USEPA's chronic ambient water quality criteria (AWQC). Many ESLs are already based on AWQC. The next appropriate tier would be the application of IDEM's AWQC, followed by Michigan DEQ's final chronic values (FCVs).

  Response: The 10x factor is not intended as a NOAEL-to-LOAEL adjustment factor and instead reflects a conservative estimate of dilution and attenuation that occurs when groundwater discharges to surface water. Dilution and attenuation must be accounted for in order to accurately predict ecological risks because ecological receptors are not directly exposed to constituents in groundwater. The EI CA750 guidance (USEPA, 1999b) recognizes the appropriateness and conservatism of accounting for dilution and attenuation using a 10x factor. Given that the EI CA750 guidance applies to the same regulatory program (i.e., RCRA) as this SLERA and is also intended as a conservative screening tool, it is applicable to this purpose.

  In light of the Site's current regulatory status and all parties' preference to move quickly towards remediation, expansion of the SLERA methodology is an efficient means of proceeding. An expanded SLERA will eliminate those compounds that, upon discharge to surface water, will be present at concentrations below conservative screening values. This approach may eliminate the need for a BERA altogether or, if a BERA is needed, ensure that it focuses on those constituents most likely to pose ecological risk.

  Given the importance and appropriateness of accounting for dilution and attenuation as groundwater discharges to surface water via the breach in the

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sheet piling, the question then becomes one of methodology. Collection of empirical data (i.e., sampling surface water immediately downstream of the breach) is not an option for this site given the many sources of constituents to the canal. Due to the presence of numerous sources, direct measurement of surface water will not enable us to determine which constituents originate in site groundwater. Therefore, modeling is necessary to estimate dilution and attenuation upon discharge of groundwater to surface water.

Dilution and attenuation of groundwater could be modeled based on flow and volume of groundwater discharged through the breach in the sheet piling relative to canal flow and volume. However, variability in all factors may result in considerable variability and uncertainty in the model's output. Such modeling also would slow down the overall assessment and remediation process, since a breach in sheet piling is not a standard scenario considered in off-the-shelf models. In our experience generating site-specific dilution and attenuation factors for waterways of similar scale, we have observed that the resultant dilution and attenuation factors tend to be much greater than 10, sometimes by orders of magnitude. Therefore, we expect the 10x dilution and attenuation factor to be quite conservative. For these reasons, we recommend retaining the 10x dilution and attenuation factor as an expansion of the SLERA, based on its ease of implementation, regulatory precedent, and conservatism.

If there are chemicals in groundwater present with a 95% UCL concentration greater than 10 times the screening value, it may still be necessary to generate a site-specific dilution and attenuation factor in order to realistically assess the risk that they may contribute. If so, then the application of the 10x dilution and attenuation factor will reduce the number of chemicals subjected to the site-specific modelling, thereby reducing time and complexity in the site-specific analysis.

We understand that the USEPA is in agreement with our proposed use of a 10x dilution and attenuation factor for chemicals that are not bioaccumulative; however, it is the USEPA's position that no dilution or attenuation for bioaccumulative chemicals can be allowed. To evaluate groundwater quality near the point of discharge to surface water, in an analysis separate from that described above, detected concentrations of constituents in only those groundwater wells most proximate to the breach in the sheet piling[1] will be compared to state water quality standards. Even the wells most proximate to the breach in the sheet piling are a conservative estimate of concentrations at the

[1] MW-827S, MW-810S, MW-826S, MW-826M, MW-809S, and MW-809M

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point of discharge; wells more distant from the breach and from the canal reflect groundwater concentrations rather than concentrations near the groundwater-surface water interface, which are not an appropriate basis for comparison to surface water standards.

If a constituent still lacks an appropriate LOAEL, then a literature search is appropriate, keeping in mind that the effects level should not exceed 20%. Also, for constituents lacking ambient water quality criteria and for which ArcelorMittal derives literature-based values, the following information should be provided to support the derived values: a detailed description of literature search and review methods, a tabulation of study methods and results for all relevant studies identified in the literature, and a complete description of the rationale for the final toxicity values selected for use in the risk assessment.

Response: We will apply these recommendations for selecting toxicity values.

- Use of the 95% upper confidence level on the mean (95% UCL) is appropriate as part of Step 3. It is not clear how professional judgment would be used "to determine the likelihood that concentrations at the groundwater/surface water interface do or will exceed refined ecological benchmarks." It would seem that the concentrations either exceed the benchmarks or they do not; professional judgment does not seem to apply.

  Response: We agree that determination of whether a 95% UCL concentration exceeds a benchmark is a binary question—either the 95% UCL does or does not exceed the benchmark. However, there can be circumstances when a 95% UCL exceeds a benchmark, but such exceedances are unlikely to translate to adverse ecological effects. This is where professional judgment may be considered within the expanded SLERA. Examples of such circumstances are described below for illustrative purposes. However, until the analysis is conducted, it is not possible to know which (if any) circumstances are pertinent to this site. As such, the following examples are hypothetical.

  The magnitude of 95% UCLs is directly tied to sample size and variability across results. As such, the 95% UCL may be quite high (e.g., higher than the maximum measured concentration) if the sample size is low and/or the data set is highly variable. Its value also may be unduly influenced by non-detect results with elevated detection limits. Even if the 95% UCL is not strongly influenced by such data limitations, an exceedance of a benchmark may reflect conservatism inherent in the benchmark.

  If the benchmark was developed from a published study (which may be the only study available) that is not very representative of the Indiana Harbor, uncertainty

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in the benchmark may contribute to uncertainty in interpreting the implications of exceeding the benchmark. For example, the study used as the benchmark basis may have been conducted under very different environmental conditions or with test organisms that are not present or under conditions that do not represent the Indiana Harbor area. These are the types of factors that may be considered qualitatively while comparing 95% UCLs to benchmarks and judging the environmental implications of any exceedances. Presentation of such considerations represents an expansion of the typical SLERA.

- Step 4: Regarding refined ecological benchmarks, note that the USEPA and state ambient water quality criteria are typically developed based only on direct exposure to aquatic organisms, and use of these criteria may not be adequately protective of exposures through food web pathways. Additional methods for evaluating dietary risks to aquatic life may be needed for persistent, bio-accumulative, and toxic chemicals. Risks to higher level trophic receptors need to be considered through food chain modeling, if necessary.

  Response: Bioaccumulative chemicals of potential ecological concern (COPECs) will be defined consistent with Table 4-2 in http://water.epa.gov/polwaste/ sediments/cs/biotesting_index.cfm. Dilution and attenuation will not be considered for bioaccumulative COPECs detected in wells most proximate to the breach in the sheet piling[1]. In order to estimate potential risks to higher trophic level receptors as a result of exposure to bioaccumulative COPECs, we will apply literature-derived bioconcentration factors and/or foodweb modeling in order to estimate concentrations of bioaccumulative COPECs in fish tissue. Due to the absence of suitable habitat for mink, otter or other fish-eating mammals near the site, the expanded SLERA will evaluate potential risks to fish-eating birds. Dietary uptake of bioaccumulative COPECs by fish-eating birds will be modeled and estimated doses will be compared to toxicity reference values (TRVs) that are protective of similar bird species. That comparison will yield hazard quotients (HQs), the ratio of dose to TRV. HQs equal to or less than one indicate that no further evaluation is warranted, while HQs greater than one indicate that further evaluation is necessary to understand the likelihood of adverse effects.

- Additional detail regarding the calculation of the refined exposure point concentrations (EPC) is needed prior to approval. Please tabulate all monitoring wells and sample dates that will be included in the EPC calculations, and describe the approach that will be taken with respect to time-series data. It may be most efficient if the USEPA and

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ArcelorMittal reach agreement on these details before EPC and risk calculations are conducted.

Response: Our primary objective in selecting monitoring wells and sampling events for inclusion in calculating the EPC is to identify and include data that are most representative of discharges to the ship canal via the breach in the sheet piling. Secondary and related objectives are to avoid diluting results with less applicable data and to retain data that are consistent with the most representative data. For example, if wells are included that are not immediately adjacent to the shoreline and the breach in the sheet piling, then the data used in the analysis would reflect groundwater concentrations rather than concentrations at the groundwater-surface water interface. Since the screening values to be used in this analysis are protective of organisms that live in surface water, the comparison is only meaningful and technically supportable if the data used for screening represent the same or similar environmental media. To include a broader range of wells in this comparison would be analogous to including indoor air data in an analysis of compliance with ambient air standards. Moreover, it is important to note that measured horizontal hydraulic gradients support the conceptual site model that shallow groundwater flow is re-directed to the breach in the sheet piling. As shown on Figures 6 and 7 of the January 2014 Additional Site Investigation Report, groundwater elevations measured in October 2012 and July 2013 do not indicate hydraulic gradients indicative of groundwater flow from well MW-807S to the southeast toward well MW-817S near the sheet piling, nor from well MW-808S toward well MW-818S, also near the sheet piling. In contrast, the available data do indicate hydraulic gradients indicative of groundwater flow to the southeast in the area of the breach. Based on this hydraulic information, groundwater quality data for those wells near the breach are retained for evaluation of concentrations near the groundwater-surface water interface.

Given the objectives described above, the monitoring wells most proximate to the breach—both laterally and vertically—were selected for inclusion. These wells are MW-827S, MW-810S, MW-826S, MW-826M, MW-809S and MW-809M. On this basis, it is appropriate to pool groundwater data across these six wells.

These six wells were sampled in both 2012 and 2013. In order to determine whether it is appropriate to pool the groundwater data for these six wells across the two sampling events, we plotted the probability distribution functions for the resultant data by year for five representative constituents (arsenic, benzene, cyanide, sulfate and ammonia). As shown below, the probability distribution functions are qualitatively similar across the 2 years for the five representative

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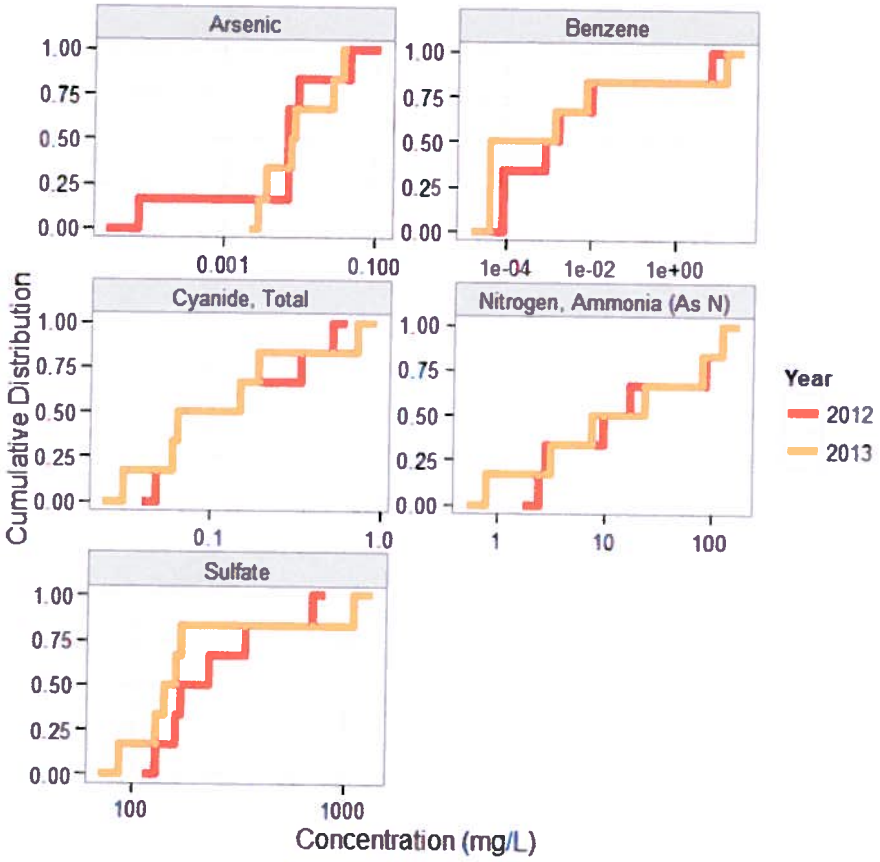
constituents. On this basis, it is also appropriate to pool data for the six wells across the two sampling events (i.e., 2012 and 2013).

In summary, we propose to calculate 95% UCL concentrations by pooling groundwater data for wells MW-827S, MW-810S, MW-826S, MW-826M, MW-809S and MW-809M across wells and across years, an approach that best meets the objectives listed in the opening paragraph of this response.



- Note that ArcelorMittal should discuss, and the USEPA will consider, the uncertainty around any qualitative evaluations of fate and transport. Quantitative evaluation is preferred.

  Response: Qualitative evaluation of fate and transport, to the extent that it is employed at all, is expected to take the form of general conclusions regarding anticipated chemical behavior based on each constituent's volatility, solubility,

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and/or partitioning behavior, as well as the water's hardness. For example, volatile compounds (as defined by chemical class and/or Henry's Law coefficient) will volatilize upon discharge from groundwater into surface water. As such, volatile compounds are not expected to accumulate in surface water over time. Similar qualitative fate and transport discussions may be presented in the expansion of the SLERA.

As discussed above, a fate and transport model may be used to quantitatively estimate site-specific dilution and attenuation that occurs when groundwater discharges to surface water via the breach in the sheet piling. The site-specific model would be developed if one or more constituents are found to warrant further site-specific evaluation.

In addition, ArcelorMittal should confirm that there is no discharge of groundwater to bottom sediments in the Indiana Harbor Ship Canal (i.e., that groundwater only discharges to the canal through breaches in sheet pile wall). If this assumption is not correct, additional ecological risk evaluation will be required.

Also see USEPA's response to Comment 16, as it relates to this comment.

Response: Indiana Harbor Ship Canal sediments are not germane to this assessment for the following reasons:

1. ***The Canal and Turning Basin are being remediated by the Army Corps of Engineers with funds supplied by multiple parties.***
2. ***The contribution, if any, from the Coke Plant cannot be readily distinguished from the documented current and historic upstream sediment loading from other industrial facilities.***

Even if the above were not key factors at this site, the following information leads to the conclusion that groundwater is discharging to the Indiana Harbor Ship Canal through breaches in the sheet pile wall, rather than to bottom sediments in the Canal:

> ***Sheet pile barriers were historically emplaced within the Indiana Harbor Ship Canal to define and create the Indiana Harbor Ship Canal. These interlocking walls of sheet steel were driven through the permeable Calumet aquifer and anchored in the underlying low permeability confining unit. Groundwater to surface water discharges along the Indiana Harbor Ship Canal and Lake Michigan shorelines were estimated by AECOM in 2009, based on the results of flow modeling using an analytic element model known as GFLOW.***

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Based on the results of model calibration and sensitivity analysis, the estimated hydraulic conductivity of the sheet pile revetments is on the order of 5 x 10^{-7} cm/s. This hydraulic conductivity is 99.998 percent less than the estimated hydraulic conductivity of Calumet aquifer sands, based on geometric mean of in-situ hydraulic conductivity testing conducted in ten shallow monitoring wells at the Former Coke Plant site (3.1 x 10^{-2} cm/s). Groundwater elevation data for Coke Plant shallow monitoring wells located in closest proximity to the Indiana Harbor Ship Canal reveal the presence of groundwater mounding that is consistent with the discontinuity in hydraulic conductivity between the Calumet aquifer sands and the sheet pile barrier. Ranges in measured groundwater elevations obtained in October 2012 and July 2013 for the shallow monitoring wells are summarized as follows.

For the October 2012 data, groundwater elevations for those wells near the shoreline where the sheet pile barrier is present (MW-817S and MW-818S) ranged from 581.83 to 582.36 feet, whereas the groundwater elevations for those wells near the shoreline where the sheet pile barrier is absent to a depth of 25 feet (MW-810S, MW-826S and MW-827S) ranged from 577.69 to 580.05 feet.

For the July 2013 data, groundwater elevations near the shoreline where the sheet pile barrier is present ranged from 583.70 to 584.92 feet, and the groundwater elevations near the shoreline where the sheet pile barrier is absent ranged from 578.78 to 580.81 feet.

The groundwater elevation data near the sheet pile barrier are approximately 3 to 4 feet greater than in the shoreline area of the sheet pile barrier breach. Based on the available data, the sheet pile barrier is re-directing groundwater flow towards the breached area. In addition, based on information contained in Cohen et al. (2002), hydraulic conductivities in the Calumet aquifer are generally 100 to 10,000 times greater than hydraulic conductivities in the underlying and continuous clay confining unit, as will be further documented in the revised Additional Investigation Report. Moreover, groundwater flow in the underlying confining unit is mostly vertical with relatively minor amounts of horizontal flow.

The observed groundwater mounding near the sheet pile barrier relative to groundwater levels near the breach, coupled with the reported absence of horizontal groundwater flow in the underlying clay confining unit (within which the sheet pile barrier is anchored), lead to the conclusion that groundwater is discharging to the Canal through breaches in the sheet pile wall, rather than to bottom sediments in the Indiana Harbor Ship Canal.

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4. The majority of this response is acceptable, but two concerns remain:

   - On page 8 of the response letter, ArcelorMittal asserts that the vertical extent of arsenic has been delineated at boring MW-824D. However, soil samples were only collected from two intervals (1-2 feet bgs, and well below the water table at 38.5-39.5 feet bgs). Although we agree that the water table (at approximately 8 feet bgs) can be used to vertically delineate the extent of contamination, there is no data with which to confirm that soil between 2 and 8 feet bgs at boring MW-824D does not contain DQO exceedances. This data gap should be addressed during the planned Pre-Design Investigation.

     Response: As part of the planned Pre-Design Investigation, a soil boring sample will be retained from the two foot interval above the water table near the location of boring MW-824D, and submitted for laboratory analysis. Additional information regarding the scope of this planned task will be provided in the Pre-Design Work Plan.

   - On page 8 of the response letter, ArcelorMittal also asserts that the extent of polynuclear aromatic hydrocarbons (PAH) exceedances found in the uppermost soil sample at boring MW-826M cannot be vertically delineated due to insufficient soil recovery between 2 and 9 feet bgs. The Pre-Design Investigation should also include advancement of a soil boring in the vicinity of boring MW-826M in an effort to delineate the vertical extent of PAH contamination in this area.

     Response: As part of the planned Pre-Design Investigation, a soil boring sample will be retained from the two foot interval above the water table near the location of boring MW-826M, and submitted for laboratory analysis. Additional information regarding the scope of this planned task will be provided in the Pre-Design Work Plan.

5. The response to this comment is acceptable.

   Response: Confirmed

6. The response to this comment is acceptable.

   Response: Confirmed

II. SPECIFIC COMMENTS

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- **Section 2.2.2, Groundwater Sample Results, page 10**

1. In the response, ArcelorMittal indicates that "the clay layer is laterally extensive across the former Coke Plant site." However, just because the clay may be extensive does not mean that it is continuous and, therefore, capable of acting as a hydraulic barrier to contaminant migration. The report must provide additional detail as to whether the clay has been consistently identified in each boring of similar depth at the former Coke Plant site. If an insufficient number of borings has been advanced to this depth, the Pre-Design Investigation should also include steps to confirm and document that the aquitard is continuous across the site.

   Response: The estimated thickness of clay and silt overlying the carbonate bedrock within the vicinity of Indiana Harbor based on lithologic information from 40 soil borings is attached. Based on this information, the thickness of clay and silt overlying the carbonate bedrock near the Former Coke Plant ranges from 80 to 100 feet.

   The first paragraph in Section 3.3.4 will be revised as follows to support the conclusion that a clay layer below the shallow aquifer represents an aquitard, and defines the vertical extent of impacted groundwater:

   "The Calumet Aquifer is a water table or unconfined aquifer with a saturated thickness of approximately 33 feet (MW-801D) at the former Coke Plant. At borings installed within the eastern portion of the former Coke Plant, the lower portion of the Calumet aquifer consists of dense silt (approximately 4 to 11 feet thick). As indicated on geologic cross-sections presented on Figures 4 and 5, silty clay soils are encountered below the sand or silt soils. The clay layer is laterally extensive across the former Coke Plant site, as it was encountered during advancement of all 14 deep soil borings installed to date. The silty clay soils are present at depths ranging from approximately 37.5 beet bgs at the location of well MW-817D, to 44 feet bgs at the location of well MW-821D (i.e., approximately 40 feet bgs). These silty clay soils represent an aquitard, and define the vertical extent of impacted groundwater. Based on regional soil boring information, the thickness of the clay and silt layer overlying the carbonate bedrock near the Former Coke Plant ranges from 80 to 100 feet. The water table is generally encountered at elevations ranging from 578.8 feet to 588.3 feet mean sea level (MSL) (July 2013 data), which correspond to a water table depth of approximately 6 to 15 feet bgs (Table 1)."

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2. The response to this comment is largely acceptable, but the revised text should note that mounding in the northeastern portion of the site was observed in *both* shallow and deep groundwater in July 2013.

   Response: The second paragraph in Section 3.3.4 (Site-Specific Hydrogeology) will be revised as follows to further describe groundwater flow.

   "The groundwater flow direction based on water table elevations in the shallow monitoring wells is generally toward the southeast, toward the Indiana Harbor Ship Canal (as illustrated on Figures 6 and 7). The October 2012 shallow groundwater contours (Figure 6) indicate the presence of a potential localized groundwater mound centered on monitoring well MW-825S, with radial outward flow from that location; however, overall shallow groundwater flow on the former Coke Plant site is to the southeast. The July 2013 shallow and deep groundwater contours (Figures 7 and 9, respectively) also indicate a potential mounding or groundwater high in the northeast portion of the site with a localized southwesterly component of groundwater flow within the northern portion of the former Coke Plant site. However, overall shallow and deep groundwater flow at the former Coke Plant site is to the southeast. For the shallow groundwater, hydraulic gradients generally increase across the site toward the canal and are highest near the extreme southern portion of the site, in the vicinity of the breach in the sheet pile wall."

3. The response to this comment is acceptable.

   Response: Confirmed.

- **Section 4.1, Soil Sample Data Quality Review, pages 18-20**

4. The response to this comment is acceptable.

   Response: Confirmed

5. The portion of this response addressing data gaps in contaminant delineation is acceptable. However, the revised text must be further modified as discussed in General Comment 1 above. Based on currently available information, we cannot find that the direct contact pathway has been eliminated.

   Response: The third full paragraph on page 30 will be revised as follows. The one paragraph has been divided into two paragraphs for clarity:

   "Slag-fill and soil samples retained for laboratory analyses were collected from the upper 2 feet of the original slag-fill material and from the 2-foot interval above

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the water table. Soil samples from the bottom two feet of the deep well borings were also retained for laboratory analyses. The planned second soil sample was not collected from borings MW-825S, MW-826S, MW-826M, SB-873S, and SB-874S due to either the presence of debris (concrete/gravel fill) or poor recovery at the two-foot interval above the water table at these locations. The shallow slag-fill/soil samples obtained from 1 to 2 feet bgs from two of these five borings (MW-825S and MW-826M) contained PAH concentrations greater than IDEM direct contact and default closure level DQOs. The IDEM direct contact criteria apply to near surface samples (that are obtained from 0 to 2 feet bgs). However, up to 6 feet of clean granular fill materials and a geotextile material were placed over the site in 2009. This redevelopment activity has likely eliminated the direct contact exposure pathway, as previously-identified impacted slag/soil is no longer present within the typical contact zone (i.e., within the uppermost 2 feet of soil/fill at grade) where the clean granular fill materials are present. In conjunction with the intended sampling and evaluation of the uppermost 2 feet of soil as indicated in response to General Comment 1 above, the uppermost 2 feet of soil will also be evaluated near borings MW-825S and MW-826M. Additional information regarding the scope of this planned task will be provided in the Pre-Design Work Plan.

IDEM migration to groundwater DQOs are applicable to samples obtained from near the water table. Neither of the shallow slag-fill/soil samples obtained from borings MW-825S and MW-826M contained PAH concentrations greater than IDEM migration to groundwater DQOs, and none of the 2013 groundwater samples obtained from monitoring wells MW-825S and MW-826M contained concentrations of any PAHs greater than DQOs. With regard to the 2012 groundwater samples, the detected indeno(1,2,3-cd)pyrene concentration (0.000031 mg/L) at MW-826M slightly exceeded the groundwater solubility DQO of 0.000022 mg/L; however, indeno(1,2,3-cd)pyrene was not detected in the shallow soil sample at that location. No other exceedances of DQOs for PAHs were identified in the groundwater samples collected from wells MW-825S and MW-826M."

6. The response to this comment is acceptable.

   Response: Confirmed

- **Section 4.2, Groundwater Sample Data Quality Review, pages 20-22**

7. The response to this comment is acceptable.

   Response: Confirmed

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- **Section 5.3, Monitoring Well Installation, page 25**

8. The response to this comment is acceptable.

   Response: Confirmed

- **Section 5.4, Groundwater Sampling Procedures, pages 25 and 26**

9. The response to this comment is acceptable.

   Response: Confirmed

- **Section 6.1, Slag-Fill/Soil Sample Results, pages 28-30**

10. The response to this comment is acceptable.

    Response: Confirmed

- **Section 6.2, Groundwater Sample Results, page 30**

11. The response to this comment is acceptable.

    Response: Confirmed

- **Section 6.1.2.3 (sic), Polynuclear Aromatic Hydrocarbons, page 35**

12. The response to this comment is acceptable.

    Response: Confirmed

- **Section 6.1.2.4 (sic), Select Metals, pages 35 and 36**

13. ArcelorMittal is correct in that the first paragraph on page 36 already notes that arsenic exceeded its IDEM maximum contaminant level (MCL) in wells MW- 805S in July 2013. The original comment inadvertently referred to the MCL, when it should have requested that the text be revised to note that arsenic exceeded the IDEM industrial DQO in well MW-805S in July 2013. Revise the second half of the paragraph accordingly.

    Response: The first paragraph on page 36 will be revised as follows.

    "Detected arsenic concentrations ranged as high as 0.20 mg/L, and exceeded the IDEM Default Closure and MCL DQO of 0.01 mg/L in October/November 2012 and/or July 2013 samples collected from the following wells: MW-801S, MW-803D, MW-804S, MW-805S, MW-805D, MW-806S, MW-806D, MW-807D, MW-808S, MW-808D, MW-809M, MW-809D, MW-812S, MW-815S, MW-816S, MW-816D, MW-817D, MW-818S, MW-820S, MW-821D, MW-822D, MW-823D, and MW-826S. In

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addition, detected arsenic concentrations exceeded the IDEM Industrial DQO of 0.0019 mg/L in October/November 2012 and/or July 2013 samples collected from the following wells: MW-801S, MW-803S, MW-804S, MW-805S, MW-807S, MW-809S, MW-810S, MW-811S, MW-814S, MW-817S, MW-819S, MW-821S, MW-822S, MW-823S, MW-825S, MW-827S, MW-803M, MW-809M, MW-826M, MW-801D, MW-805D, MW-815D, MW-819D,MW-822D, and MW-824D. Fifty-six of the 85 detected arsenic concentrations were between the MDL and RL."

14. The response to this comment is acceptable.

    Response: Confirmed

- **Section 6.1.2.6 (sic), Applicability of Ecological Screening Levels, pages 37-40**

15. The response to this comment is acceptable.

    Response: Confirmed

16. The Response to Specific Comment 16 needs to be revised, consistent with the discussion in Response to General Comment 3. ArcelorMittal appears to be proposing the same approach to human health risk assessment. That approach would also not be appropriate. The text identifies arsenic, benzene, toluene, and pentachlorophenol as constituents for further evaluation for potential human health and ecological risk. However, based on review of Table 11, this list appears relevant to human health risk only. The list of constituents to be evaluated further for ecological risk, according to the approach described in General Comment 3, should include all constituents that exceed the ecological screening level. Aquatic impacts related to conventional parameters ammonia, chloride and phenols should also be addressed. There appear to be significant ammonia and chloride contamination at depth.

    With respect to human health risk, the USEPA concurs with the plan to perform a Focused Human Health Tiered Risk Assessment for further human health risk evaluation at the site. This Tiered assessment would be focused specifically on groundwater contaminants which currently discharge or have the potential to discharge to surface water. The USEPA has the following comments and requirements for the Focused Assessment:

    (a) The USEPA will view the proposed Focused Assessment as a baseline evaluation for all detected contaminants which have the potential to contribute to discharges to surface water based on the available groundwater monitoring data. (Response 16 cites a "less than 10 times the applicable groundwater standard" as a factor

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applied in the groundwater environmental indicator report. That procedure is useful for evaluating the need for groundwater migration controls, but it is not appropriate as a screening procedure for a baseline risk assessment.) Consequently, the USEPA does not believe that it is appropriate to screen out all of the constituents which have maximum detected concentrations less than ten times higher than their respective drinking water standards. Those constituents could also contribute to the baseline exposure and health risk associated with groundwater releases to surface water. The list ·of detected "Constituents in Groundwater" shown in Table 11 of the letter response appears to be the appropriate starting list for constituents of concern (COCs) in the human health assessment. If there are constituents in Table 11 which are a concern for a baseline ecological assessment but not for a baseline human health assessment, those constituents may be candidates for removal from the COC list after appropriate rationale is provided.

Response: The approach to identifying human health chemicals of concern for groundwater is proposed to be revised as follows: 1) any groundwater constituent present at a concentration less than the respective maximum contaminant level (MCL) will not be considered further. The rationale for this approach is if the concentration is safe for drinking water it is also acceptable in this exposure context (i.e., discharge to the canal) and 2) constituents that do not have an MCL or are present at concentrations greater than the MCL will be considered through comparison with a risk-based concentration that will be derived to be protective of a reasonable maximum exposure scenario for contact with contaminants in the canal surface waters (i.e., an exposure scenario for accidental immersion in the canal). This scenario will be fully described in the screening assessment and is also summarized under 16.c below. Briefly, the USEPA RAGs (1998) equations will be solved for the concentration term using a 1 in 1,000,000 cancer risk for carcinogens and a hazard index of 1 for non-cancer effects. USEPA toxicity values will be applied using the USEPA hierarchy of values (USEPA, 2003 and 2013). Exposure parameters will be drawn from the USEPA guidance including the USEPA 2011 Exposure Factors Handbook (USEPA, 2011) and the USEPA 2014 Update of Standard Default Exposure Factors and other resources as appropriate.

(b) For Step 1 of the Tiered assessment, it would be appropriate for the COCs identified in #1) above to have individual exposure point concentrations determined by calculating 95% UCL mean concentrations. That approach is acceptable with the following conditions. The USEPA ProUCL procedure and recommendations should be followed (http://www.epa.gov/osp/hstl/tsc/software.htm). The assessment needs to explain

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which set of groundwater data will be used for the calculations. For example, will only data from monitoring wells located immediately upgradient of the breached sheet pile wall be used, and will data from all sampling events be used. If the recent groundwater constituent data show significant upward (or downward) trends in concentration, then the effect of concentration trends on the calculated UCL concentrations should be addressed in the analysis (the ProUCL guidance also presents options for handling non-detect values).

Response: The applicable groundwater data, and rationale for its use, are detailed in response to Comment 3. In summary, we propose to calculate 95% UCL concentrations by pooling groundwater data for wells MW-827S, MW-810S, MW-826S, MW-826M, MW-809S and MW-809M across wells and across years. The USEPA recommended ProUCL software and procedure will be followed and output will be documented and provided with the report.

(c) For Step 2, the assessment must explain why the apparent proposed exposure scenario (i.e., very short-term whole body exposure) is the appropriate conservative and only exposure scenario needed for the risk evaluation of all the COCs. This concern is relevant in light of the potential for long-term or chronic continuing COC discharges from groundwater that could have a range of physical-chemical properties (e.g., volatile, semivolatile, deposition to sediments). As suggested for Step 2, after the baseline individual and cumulative risks and hazard estimates are calculated, the assessment may consider uncertainty and sensitivity factors such as the effects of dilution, comparison to federal/state groundwater standards, and COC fate and transport.

Response: The site is heavily industrialized with no direct access to groundwater now or in the future for non-site personnel and is fenced and monitored 24 hours per day. The migration of groundwater to offsite surface water and sediments are potential exposure pathways. For reasons discussed in response to Comment 3, assessment of sediments is not germane to this evaluation. Even if sediments were germane, however, the potential for contact with sediments is minimal. Access to the canal, to the extent that it occurs at all, could only occur by boat. Contact with surface water in the canal is therefore expected to be limited to contact during water sports. In the unlikely event of surface water contact during water sports in the canal, contact with sediment is likely to be rare/negligible and, even if it does occur, surface water would readily wash the sediment off the body.

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Some of the identified constituents present in groundwater are highly volatile (e.g., benzene), and thus could move from groundwater to surface water to outdoor air. Given the concentrations in groundwater, volatile constituents would be expected to be quickly dissipated. This pathway will be further evaluated in a qualitative or semi-quantitative manner.

As noted above, some limited use of the canal for recreational boating is possible though unlikely. Consequently, exposure for a person who contacts chemicals of concern in surface water is considered to be a reasonable maximum exposure scenario. Specifically, as described under the response to Comment 16a, a scenario assuming an individual becomes accidentally immersed in the canal will be used to derive risk-based concentrations for surface water. Ingestion and dermal contact with chemicals in surface water will be evaluated in this scenario and risk-based concentrations will be derived using the USEPA guidance and algorithms. The screening level assessment will include a conceptual site model that will describe all potential exposure pathways.

(d) For Step 3, the assessment should identify the individual COCs or combination of COCs that exceed risk or hazard index limits. The assessment can explain how already planned remediation methods might mitigate those risks. But the USEPA is likely to require confirmation sampling (e.g., groundwater, soil contaminant sources) before concluding that no further action is required.

Response: Comment acknowledged. Step 3 of the screening assessment will be conducted as requested by the USEPA.

- **Section 7.1, Site Geology and Hydrogeology, page 43**

17. The response to this comment is acceptable.

Response: Confirmed

- **Section 7.2, Soil Conditions, pages 43 and 44**

18. The response to this comment is acceptable.

Response: Confirmed

- **Section 7.4, LNAPL Conditions, page 46**

19. The response to this comment is acceptable, although clarification of ArcelorMittal's intent is required. USEPA's assumption is that you will evaluate the extent of LNAPL

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contamination in the pre-design investigation and the remedial objective is remove the source and the accumulated NAPL as part of the remedy.

Response: ArcelorMittal will evaluate the extent of LNAPL as part of the Pre-Design Investigation, and the remedial objective is to remove or otherwise mitigate accumulated NAPL as part of the remedy.

- **Figure 10, DQO Exceedances in Soil**

20. The response to this comment is acceptable.

Response: Confirmed

- **Figure 11, DQO Exceedances in Shallow Groundwater**

21. The response to this comment is acceptable.

Response: Confirmed

- **Figure 12, DQO. Exceedances in Intermediate Groundwater**

22. The response to this comment is acceptable.

Response: Confirmed

- **Figure 13, DQO Exceedances in Deep Groundwater**

23. The response to this comment is acceptable.

Response: Confirmed

- **Figure 14, Benzene Isoconcentrations in Shallow Groundwater**

Although the figures have been revised to use dashed lines showing the inferred nature of the contaminant footprint, there is still uncertainty with regard to the extent of exceedances west of well MW-819S/D and south of well MW-824S/D. Dashed lines should also be used to project the contaminant footprint in groundwater in these areas.

Response: The enclosed revised Figure 14 includes a dashed 0.5 mg/L benzene contour west of well MW-819S/D and south of well MW-824S/D.

- **Figure 16, Benzene Isoconcentrations in Deep Groundwater**

24. The response to this comment is acceptable.

Response: Confirmed

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- **Table 11, Evaluation of ESLs**

25. The response to this comment is acceptable.

Response: Confirmed

As indicated in the ArcelorMittal letter dated June 26, 2015, a final revised *Additional Site Investigation Report* will be provided within 30 days of the USEPA's approval of this final ArcelorMittal comment response letter to the April 28, 2015 USEPA correspondence. In addition, a Pre-Design Work Plan for the Former Coke Plant will be submitted to USEPA within 90 days of receipt of USEPA's approval of this final ArcelorMittal comment response letter. The Pre-Design Work Plan will also include (as an appendix) the results of the Focused Ecological and Human Health Tiered Risk Assessments discussed herein (in response to General Comment 3 and Specific Comment 16 of the April 28, 2015 USEPA correspondence). If you have any questions regarding ArcelorMittal's responses to USEPA's comments, please contact us at your convenience.

Sincerely,

ArcelorMittal USA

Thomas Barnett
Manager, Environmental Technology

Attachments: Benzene Iso-Concentrations in Shallow Groundwater - July 2013 (Figure 14)
Thickness of Clay and Silt Overlying Carbonate Bedrock, Indiana Harbor

cc: Keith Nagel, ArcelorMittal USA
Cary Mathias, ArcelorMittal USA
Jeanne Tarvin, Ramboll Environ

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References

Cohen, D.A., Greeman, T.K., and P.M. Buszka, 2002. *Surface-Water and Ground-Water Hydrology and Contaminant Detections in Ground Water for a Natural Resource Damage Assessment of the Indiana Harbor Canal and Nearshore Lake Michigan Watersheds, Northwestern Indiana*, U.S. Geological Survey Administrative Report, 135 pp.

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USEPA, 2013. Superfund Risk Assessment: Human Health: Toxicity (Hazard Identification and Dose Response) http://www.epa.gov/oswer/riskassessment/superfund_toxicity.htm.

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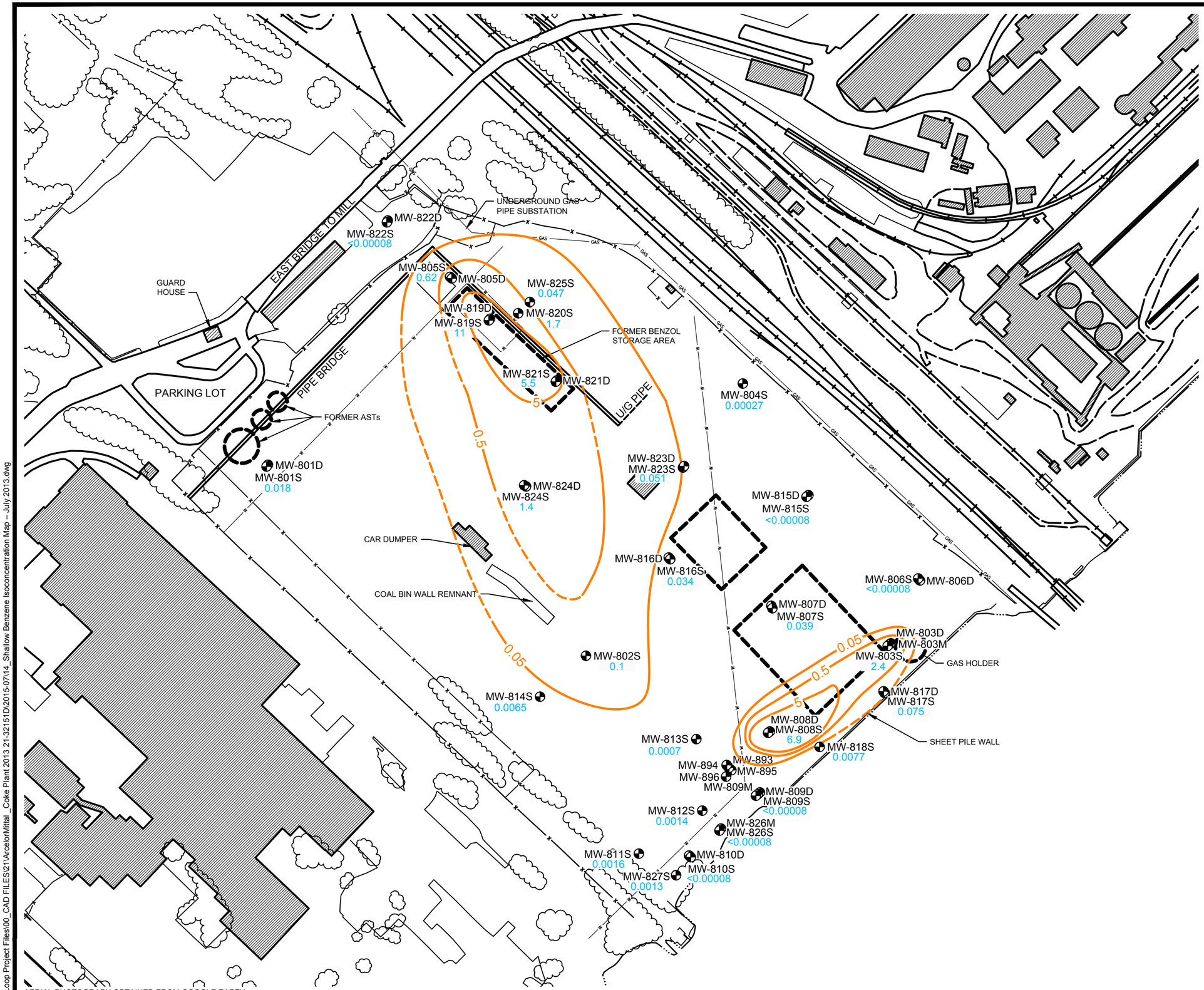
Attachment 1

Benzene Iso-Concentrations in Shallow Groundwater – July 2013 (Figure 14)



LEGEND

- MONITORING WELL
  'S' DENOTES WATER TABLE WELL
  'M' DENOTES INTERMEDIATE WELL
  'D' DENOTES DEEP WELL
- FENCE
- FENCE - APPROXIMATED PROPERTY BOUNDARY
- UNDERGROUND WATER MAIN
- UNDERGROUND GAS LINES
- OVERHEAD PIPE BRIDGE
- BUILDING
- CONCRETE PAD
- FORMER AMMONIA AND/OR PHENOL STORAGE AREA
- BENZENE ISOCONCENTRATION (DASHED WHERE INFERRED)
- 5.1 BENZENE CONCENTRATION (mg/L)

NOTE:

SEWER, FIRE WATER AND OTHER SUBSURFACE UTILITIES ARE PRESENT. LOCATIONS ARE CLEARED ON A CASE BY CASE BASIS.

LOCATION OF HISTORIC FACILITIES IS APPROXIMATE.

IDEM DEFAULT CLOSURE LEVEL FOR BENZENE = 0.052 mg/L

APPROX. SCALE (ft.)

0 250

BENZENE ISOCONCENTRATIONS IN SHALLOW GROUNDWATER (JULY 2013)

FORMER COKE PLANT
TECUMSEH REDEVELOPMENT, INC.
EAST CHICAGO, INDIANA

RAMBOLL ENVIRON

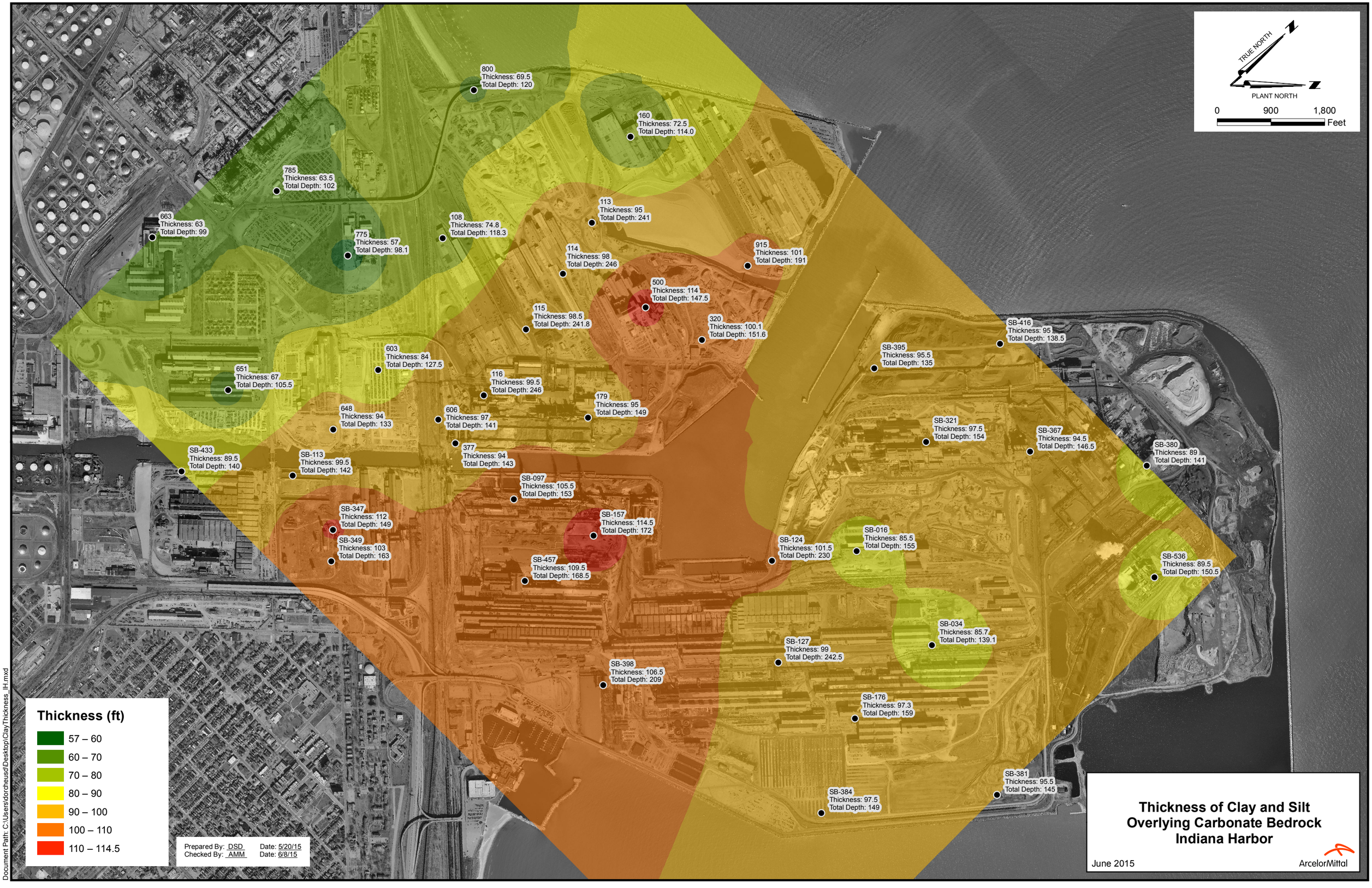
FIGURE 14

DRAFTED BY: CKL | DATE: 7/24/15 | 21-32151D

L:\Loop Project Files\00_CAD FILES\21\ArcelorMittal_Coke Plant 2013 21-32151D\2015-07\14_Shallow Benzene Isoconcentration Map – July 2013.dwg

Attachment 2

Thickness of Clay and Silt Overlying Carbonate Bedrock, Indiana Harbor


TRUE NORTH
PLANT NORTH
0
900
1,800
Feet
800
Thickness: 69.5
Total Depth: 120
160
Thickness: 72.5
Total Depth: 114.0
785
Thickness: 63.5
Total Depth: 102
663
Thickness: 63
Total Depth: 99
775
Thickness: 57
Total Depth: 98.1
108
Thickness: 74.8
Total Depth: 118.3
113
Thickness: 95
Total Depth: 241
114
Thickness: 98
Total Depth: 246
915
Thickness: 101
Total Depth: 191
500
Thickness: 114
Total Depth: 147.5
115
Thickness: 98.5
Total Depth: 241.8
320
Thickness: 100.1
Total Depth: 151.6
SB-416
Thickness: 95
Total Depth: 138.5
SB-395
Thickness: 95.5
Total Depth: 135
603
Thickness: 84
Total Depth: 127.5
651
Thickness: 67
Total Depth: 105.5
116
Thickness: 99.5
Total Depth: 246
179
Thickness: 95
Total Depth: 149
648
Thickness: 94
Total Depth: 133
606
Thickness: 97
Total Depth: 141
SB-321
Thickness: 97.5
Total Depth: 154
SB-367
Thickness: 94.5
Total Depth: 146.5
SB-380
Thickness: 89
Total Depth: 141
SB-433
Thickness: 89.5
Total Depth: 140
SB-113
Thickness: 99.5
Total Depth: 142
377
Thickness: 94
Total Depth: 143
SB-097
Thickness: 105.5
Total Depth: 153
SB-347
Thickness: 112
Total Depth: 149
SB-157
Thickness: 114.5
Total Depth: 172
SB-016
Thickness: 85.5
Total Depth: 155
SB-124
Thickness: 101.5
Total Depth: 230
SB-536
Thickness: 89.5
Total Depth: 150.5
SB-349
Thickness: 103
Total Depth: 163
SB-457
Thickness: 109.5
Total Depth: 168.5
SB-034
Thickness: 85.7
Total Depth: 139.1
SB-127
Thickness: 99
Total Depth: 242.5
SB-398
Thickness: 106.5
Total Depth: 209
SB-176
Thickness: 97.3
Total Depth: 159
SB-381
Thickness: 95.5
Total Depth: 145
SB-384
Thickness: 97.5
Total Depth: 149
Thickness (ft)
57 – 60
60 – 70
70 – 80
80 – 90
90 – 100
100 – 110
110 – 114.5
Prepared By: DSD Date: 5/20/15
Checked By: AMM Date: 6/8/15
Thickness of Clay and Silt
Overlying Carbonate Bedrock
Indiana Harbor
June 2015
ArcelorMittal
Document Path: C:\Users\dorcheusd\Desktop\ClayThickness_IH.mxd